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(54) CLUTCH RELEASE BEARING

(71) We, SKF COMPAGNIE D'APPLICATIONS MECANIQUES, a French company of 1, Avenue Newton, 92142 Clamart, France do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed to be performed to be particularly described in and by the following statement:—

The present invention relates to an elastically self-aligning clutch release bearing for plate clutches and more particularly for diaphragm clutches, said release bearing comprising inner and outer race rings, for example a ball-race rings, the inner ring being equipped with an elastic collar which allows axial sliding and permits the radial and angular movement of the outer ring, in contact with the diaphragm, for its alignment each time the clutch is disengaged.

This type of clutch release bearing comprising a ball-race or the like must preferably be provided with an elastic device which allows a certain movement of the release bearing relative to the shaft of the gearbox of the vehicle or relative to the guide tube on which the release bearing moves. One of the two rings of the ball-race of such a release bearing which transmits the declutching forces in fact comes into direct contact with the diaphragm or remains continuously in contact with the latter, whilst the other ring receives the thrust of the declutching release yoke. The ring which comes into contact, or remains in contact, with the diaphragm, for example the inner ring of the ball-race, generally has a toric support face, since the release bearing is not centered precisely on the shaft of the gearbox nor is perfectly aligned relative to the axis of rotation of the diaphragm. Furthermore, the geometrical axis of the clutch diaphragm, its axis of rotation and the axis of the shaft of the gearbox or of the guide tube do not always coincide exactly, which makes it still more necessary to provide a possible means of movement of the release bearing at each declutching operation.

It has already been proposed to produce clutch release bearings of this type which comprise means capable of ensuring their automatic alignment at each declutching operation. In these release bearings, elastic elements of varying shape are interposed between one of the rings of the ball-race and the guide tube. Thus, in U.K. Patent Specification No. 1 510 058 filed by the Applicant Company, and to the claims of which attention is drawn, the release bearing comprises an elastic collar provided with radial ridges, which come into direct contact with the guide tube and which have a particular structure so as to ensure both the rigidity and flexibility required for correct and repeated functioning of the release bearing during the functioning of the clutch of the vehicle.

In the case, which can frequently occur in practice, where the different fingers of the diaphragm which comes into contact with one of the rings of the release bearing do not all occupy exactly the same position, the coming into contact of the release bearing with the diaphragm of the clutch tends to cause the release bearing to pivot about an axis at right angles to the normal axis of movement of the release bearing. If such a clutch release bearing is actuated by means of a release yoke mounted on a swivel, there exist no other means of preventing a pivoting movement of the release bearing, which results in premature wear of the contact surface of the diaphragm.

It is an object of the present invention to overcome this disadvantage and to permit the production of a clutch release bearing which comprises guide means which avoid any pivoting of the clutch release bearing, regardless of the inaccuracies of manufacture of the diaphragm and the method of mounting of the clutch release yoke.

According to the present invention we provide an elastically self-aligning clutch release bearing of the type comprising thin-walled inner and outer race rings, the inner ring being able to slide on a guide tube via an elastic collar which possesses, on one portion of its inner surface, a plurality of radial ridges which are parallel to the axis of the release bearing and inclined relative to the radial direction, and, in use, are in direct contact with the guide tube, which release bearing further comprises a rigid guide socket arranged to extend at least partially between the inner ring and the guide tube when in position thereon, the guide socket possessing a radial flange in frictional contact with a corresponding radial flange of the inner

ring.

In a first embodiment, the elastic collar of the release bearing possesses, over its length, a portion of lesser thickness which permits seating the guide socket, without the latter coming into contact with the elastic collar during the declutching operations. In this embodiment, the guide socket preferably possesses outward-pointing radial rims which co-operate with an annular groove formed on the inner surface of the elastic collar. When the release bearing is mounted on the guide tube, the dimensions of these rims and the depth of the annular groove are such that the guide socket does not come into contact with the elastic collar regardless of the radial movement of the release bearing during a declutching operation. Before mounting the release bearing on the guide tube, this particular structure, however, makes it possible to fix the guide socket firmly to the release bearing, which facilitates its handling.

In another embodiment, the elastic collar furthermore possesses a plurality of auxiliary radial ridges which are also parallel to the axis of the release bearing and which for their part come into contact with the outer surface of the guide socket. These radial ridges, which can have the same general structure as the ridges which come into direct contact with the surface of the guide tube, are, however, preferably more flexible. Their role is in effect principally to hold the guide socket before the release bearing is mounted on the guide tube, the self-alignment of the release bearing being ensured almost exclusively by the radial ridges of the elastic collar which come into direct contact with the guide tube.

In order to increase, as far as possible, the total length of the guiding provided by the guide socket whilst leaving a sufficient number of radial ridges in direct contact with the guide tube, it is advantageous to provide, on the guide socket, axial extensions which form portions of substantially the same length as the total length of the elastic collar. Opposite these extensions of the guide socket, the elastic collar is free from the radial ridges which remain between these various extensions and come into contact with the guide tube.

In another embodiment which makes it possible to achieve substantially the same effect, the guide socket has an annular fold arranged to increase the guide length beyond the radial flange which is in contact with the radial flange on the inner ring.

In all cases, the radial ridges of the inner surface of the collar advantageously have a profile which becomes thinner towards the longitudinal axis of the collar, so as to assist a deformation of the said ridges during each declutching operation, both by compression of the material in the radial direction and by flexing in the tangential direction. The ridges are inclined relative to the radial direction so as to increase their flexibility.

The present invention will be better understood on examining some particular embodiments described by way of example which in no way imply a limitation and are illustrated in the drawings. In these:

Figure 1 is a view in cross-section of a first embodiment of a clutch release bearing according to the invention;

Figure 2 is a view in cross-section of another embodiment of a release bearing according to the invention;

Figure 3 shows, in cross-section, another embodiment of a release bearing according to the invention;

Figure 4 is a view, similar to those above, which shows yet another embodiment of a release bearing provided with a different guide socket;

Figure 5 is a section along V–V of Figure 1;

Figure 6 is a section along VI–VI of Figure 3; and

Figure 7 is a section along VII–VII of Figure 4.

As shown in Figures 1 and 5, the clutch release bearing possesses an inner ball-race ring 1, having a thin wall, which ring is produced by stamping a metal sheet or a tube and has a tubular part 2 and a toric roller track 3 for a set of balls 4. In this embodiment the tubular part 2 is extended outwards by a radial flange 5 which is itself extended laterally by two lugs 6 parallel to the axis of the release bearing and each poss possessing a cut-out 7 which co-operates whit a holding spindle 8 of the control release yoke 9, these elements being shown in broken lines in Figure 1. It will, of course, be appreciated that other means of fixing of the release yoke could be envisaged.

The ball-race of the clutch release bearing is completed by an outer ring 10, also having a thin wall, produced by stamping a metal sheet or a tube. The said outer ring possesses a toric portion 11, which can come into contact with the surface of the diaphragm 12 shown in broken lines in Figure 1, when the release yoke 9 has caused a longitudinal movement of the release bearing relative to the guide tube 13, shown in broken lines in Figure 1, inside which tube revolves the shaft of the gearbox. The balls are held by a cage 14, the race being protected by a cover 15 and sealing rings which are not shown in the figure.

A collar 16 of an elastic material, for example of plastics or rubber, is fixed by any appropriate means, for example by moulding-on, to the inner surface of the inner ring 1, thus matching it over its entire lnegth. The portion 16a of the elastic collar 16 which is present on the side of the diaphragm 12 possesses, on its internal surface, a plurality of ridges 17 arranged in groups and separated by portions of lesser thickness such as the portion 18 visible in particular to Figure 5. The ridges 17 are arranged substantially radially but are nevertheless

inclined relative to the radial direction as can be seen in Figure 5, so as to assist the deformation of the said ridges by flexing in a substantially tangential direction during the self-alignment of the release bearing at the instant of declutching.

In the embodiment shown in Figures 1 and 5, the profile of the ridges 17 is such that their width diminishes inwards, so as to improve their flexibility. Accordingly, the contact between the ridges 17 and the guide tube 13 takes place along a portion which is thin relative to the broadened base of the ridges 17.

In its portion 16b, located on the side of the release yoke 9, the elastic collar 16 is of reduced thickness, as can be seen in Figure 1, and over this portion is free from radial ridges.

A guide socket 19 is mounted between the guide tube 13 and the inner ring 1. The socket 19 comprises a radial annular flange 19a which comes into frictional contact with the radial flange 5 of the release bearing, which can move relative to the socket 19 during declutching. An axial cylindrical portion 19b of the socket 19 extends between the inner ring 1 and the guide tube 13. Sufficient play is provided between the portion 16b of the elastic collar 16 and the cylindrical portion 19b of the guide socket 19 for these two elements not to come into contact even during the movements of the release bearing for the purpose of its self-alignment.

In the embodiment shown in Figure 1, the guide socket 19 possesses a series of axial extensions 20 connected to the portion 19b and seating between the groups of radial ridges 17 of the elastic collar 16. These axial extensions 20 thus define portions of the guide socket 19 which have substantially the same length as the total length of the elastic collar 16. The extensions define, between them, openings which allow groups of ridges 17 to pass, as can be seen in Figures 1 and 5. Furthermore, the thickness of the collar 16 opposite these extensions 20 is reduced at 18 so that here again there is no danger of contact occurring between the elastic collar 16 and the guide socket 19 during the declutching operation. It can be seen that by virtue of the presence of the extensions 20 the guide socket 19, which possesses a certain play and can thus slide freely relative to the guide tube 13, has a maximum guide length which occupies substantially the entire length of the release bearing itself. The guide socket is advantageously made of a rigid material and preferably of a metal, being formed by stamping a thin metal sheet or a tube. The space which remains between the front end face of the radial ridges 17 and the extreme edge of the cylindrical portion 19b of the guide socket 19 can advantageously be utilized as a lubricant reserve for the sliding motion of the release bearing and of the guide socket on the guide tube.

When the declutching release yoke 9 is actuated, and if the fingers of the diaphragm 12 exhibit some irregularities, any pivoting of the release bearing of the invention is thus avoided by virtue of the guiding provided by the socket 19 relative to the guide tube 13, and by virtue of the presence of the flange 19a in contact with the flange 5. The self-alignment function is furthermore achieved by the presence of the radial ridges 17 in direct contact with the guide tube 13, and the presence of the guide socket 19, having a special structure as just described, does not in any way interfere with the self-alignment properties of the release bearing.

The embodiment illustrated in Figure 2 constitutes a variant of the release bearing illustrated in Figure 1. In this embodiment, where the identical components carry the same reference numbers, the elastic collar 21 possesses, as before, a portion 21a, on the side of the diaphragm 12, equipped with teeth 22 of structure identical in every respect with the ridges 17, and grouped in the same way. The guide socket 23 has the same general structure as the socket 19, except that radial rims 24 are formed on the edges of the cylindrical portion 23b corresponding to the portion 19b of Figure 1. These radial rims 24, which are thus located between the axial extensions 25 identical with the extensions 20, co-operate with an annular groove 26 formed in the elastic collar 21 between its portion 21a and its portion 21b. As can be seen in Figure 2, when the release bearing is mounted on the guide tube 13, the dimensions of these outward-pointing radial rims 24 and the depth of the annular groove 26 are such that these components do not come into contact, sufficient play being maintained even during the self-alignment of the release bearing.

When the release bearing is not mounted on the guide tube 13, the presence of these radial rims 24 which seat in the annular groove 26 makes it possible to avoid excessively easy coming-apart of the guide socket 23 from the remainder of the release bearing, thereby facilitating the handling of the whole.

In the embodiment of Figure 3, where identical components carry the same reference numbers, the elastic collar 27 has, as before, a portion 27a provided with groups of ridges 28 which come into direct contact with the guide tube 13 and are in every respect identical with the ridges 17 and 22 of the preceding embodiments.

The guide socket 19 is identical to that of the embodiment of Figure 1. The elastic collar 27, however, possesses in its portion 27b, located on the side of the declutching release yoke 9, a plurality of auxiliary radial ridges 29 which can be seen in Figure 6, parallel to the axis of the release bearing and coming into contact with the outer surface of the guide

socket 19 over its cylindrical portion 19b. As can be seen more clearly in Figure 6, the auxiliary ridges 29, which, like the ridges 28, are slightly inclined relative to the radial direction, have a lesser thickness than the radial ridges 28, so as to increase their flexibility. The self-alignment of the release bearing is principally achieved by the radial ridges 28 in direct fontact with the guide tube, the guide socket 19 avoiding the pivoting of the release bearing. By virtue of their flexibility, the auxiliary ridges 29 permit the self-alignment of the release bearing and also make it possible to improve the hold of the guide socket 19 in the release bearing when the assembly of these components is not mounted on the guide tube 13.

The embodiment in Figure 4 shows a different structure for the guide socket 30, which has an annular outer fold 31 obtained by shaping sheet metal and which has the effect of increasing the total guide length of the socket 30 on the guide tube 13. In this embodiment the increase in the guide length is thus achieved on the side of the declutching release yoke and not, as previously, by means of axial extensions pointing towards the diaphragm 12. In this embodiment, the elastic collar 32 possesses, in its portion 32a which is on the side of the diaphragm 12, a succession of radial ridges 33 which in this case is uninterrupted, the ridges being arranged substantially uniformly over the inner periphery of the portion 32a, as can be seen in Figure 7. It is thus possible, in this embodiment, to provide a larger number of self-alignment ridges 33. It will be noted that in profile the ridges 33 have the same structure as the ridges 17 of Figure 1.

The portion 32b of the elastic collar 32 has a thickness such that it defines sufficient play, permitting a movement of the release bearing during self-alignment, without the danger of coming into contact with the portion 30b of the guide socket 30, which is partially located between the portion 32b of the elastic collar 32 and the guide tube 13. Furthermore, the socket 30 also has a radial flange in frictional contact with the flange 5 of the inner ring, the flange being connected to the portion 30b by a fold 31.

It will be understood that the particular guide socket of this embodiment can perfectly well be adapted to the cases of Figures 2 and 3, that is to say can have means which ensure its hold in the release bearing before being mounted. In this case, the corresponding elastic collars would thus possess, in addition to the succession of ridges 33, an annular groove as the groove 26 or a succession of auxiliary ridges as the ridges 29.

It will also be appreciated that in the embodiments illustrated, it would be possible, without going outside the scope of the invention, to reduce the axial guide length of the socket 19, 23 or 30 by omitting the axial extensions 20, 25 or the fold 31. However, with such an arrangement less good guiding of the socket is achieved.

In all the cases the elastic collars are made from a plastics, from rubber or from any other sufficiently flexible material. The guide sockets which slide with the release-bearing on the guide tube are made of a rigid material and in particular of shaped sheet metal.

The clutch release bearing of the present invention, equipped with its guide pocket, permits elastic self-alignment and avoids any pivoting of the release bearing, thus considerably reducing the wear of the components in contact during each declutching operation.

WHAT WE CLAIM IS:—

1. An elastically self-aligning clutch release bearing of the type comprising thin-walled inner and outer race rings, the inner ring being able to slide on a guide tube via an elastic collar which possesses, on one portion of its inner surface, a plurality of radial ridges which are parallel to the axis of the release bearing and inclined relative to the radial direction, and, in use, are in direct contact with the guide tube, which release bearing further comprises a rigid guide socket arranged to extend at least partially between the inner ring and the guide tube when in position thereon, the guide socket possessing a radial flange in frictional contact with a corresponding radial flange of the inner ring.

2. A clutch release bearing according to Claim 1, in which the elastic collar possesses at least one portion of lesser thickness which permits the guide socket to be seated without contact with the elastic collar.

3. A clutch release bearing according to Claim 2, in which the guide socket possesses outward-pointing radial rims which co-operate with an annular groove of the elastic collar so as to fix the socket firmly to the release bearing before mounting on the guide tube.

4. A clutch release bearing according to Claim 1 or 2 in which the elastic collar possesses a plurality of auxiliary radial ridges parallel to the axis of the release bearing and in contact with the outer surface of the socket.

5. A clutch release bearing according to Claim 4, in which the auxiliary ridges have a greater flexibility than the radial ridges in direct contact with the guide tube.

6. A clutch release bearing according to any one of the preceding Claims, in which the guide socket has axial extensions which form portions of substantially the same length as the total length of the elastic collar, the said collar being free from said ridges in direct contact with the guide tube at locations opposite these extensions.

7. A clutch release bearing according to any one of Claims 1 to 5, in which the guide socket has an annular fold arranged to increase the guide length beyond the radial flange which is in contact with the radial flange on the inner ring.

8. A clutch release bearing according to any one of the preceding Claims, characterised in that one end face of the ridges in direct contact with the guide tube is spaced from the guide socket so as to define a lubricant reserve.

9. An elastically self-aligning clutch release bearing substantially as herein described with reference to, and as shown in, the accompanying drawings.

ERIC POTTER & CLARKSON
Chartered Patent Agents

14 Oxford Street
Nottingham
Agents for the Applicants.

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Sheet 1

FIG.1

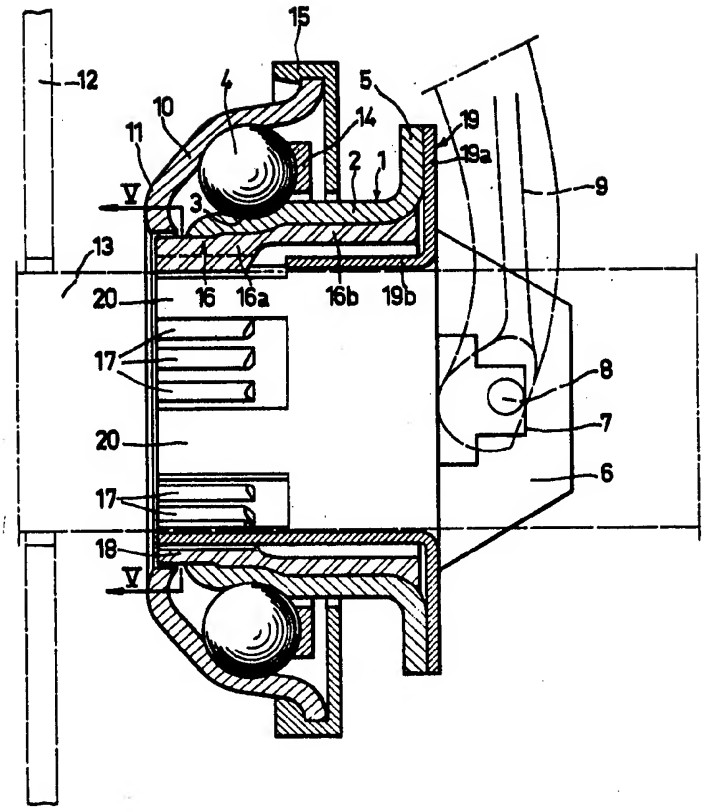

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FIG.2

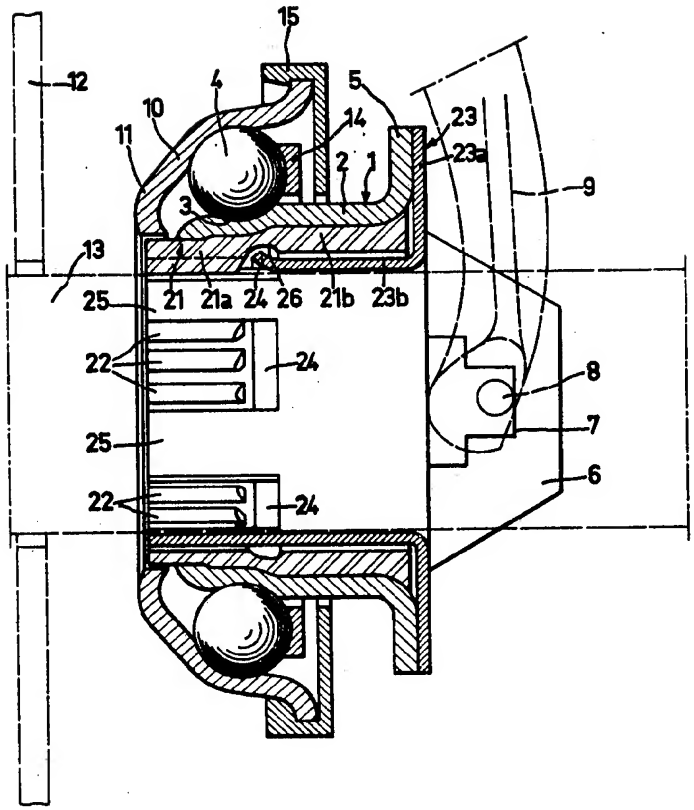

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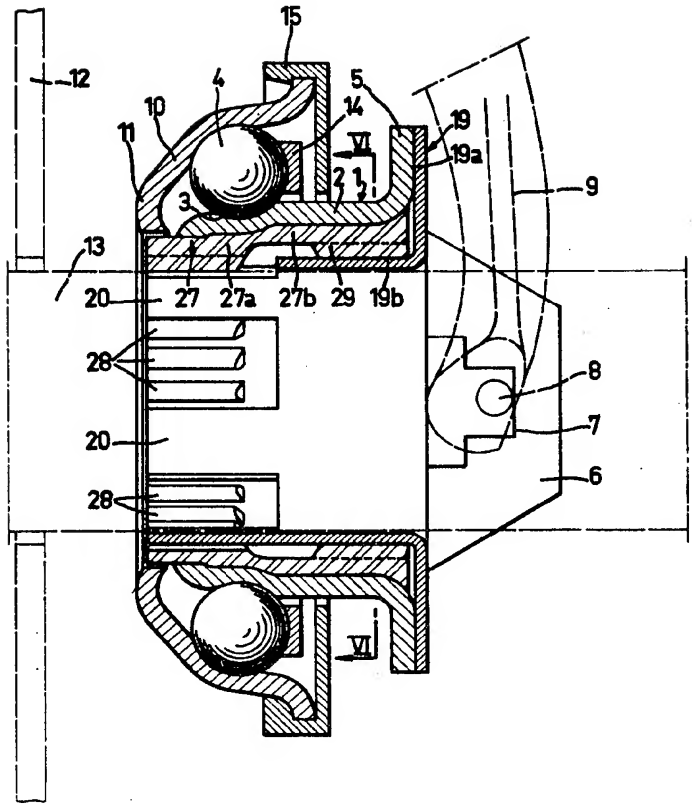
FIG.3



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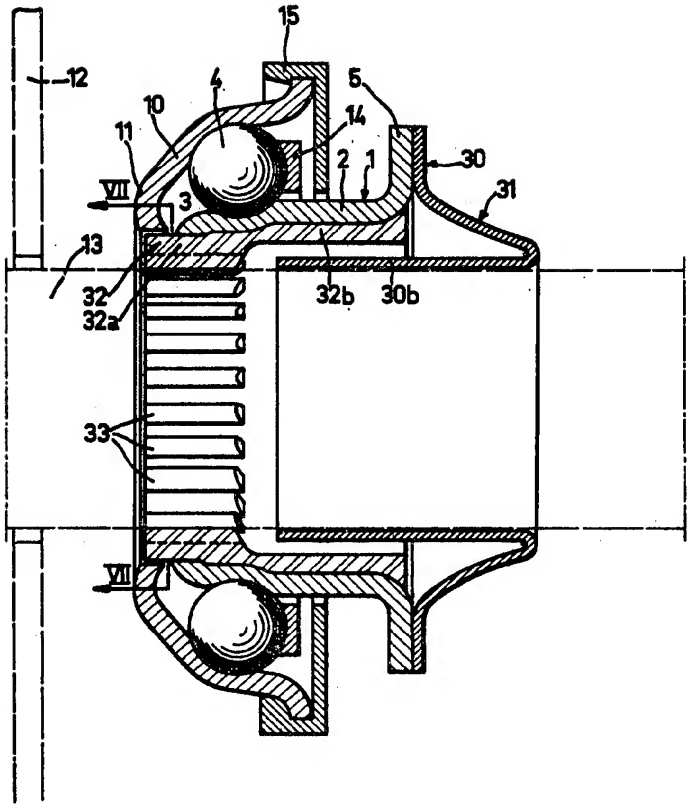
Sheet 4

FIG.4



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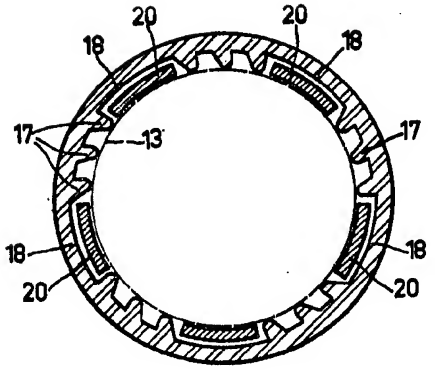
Sheet 5

FIG.5



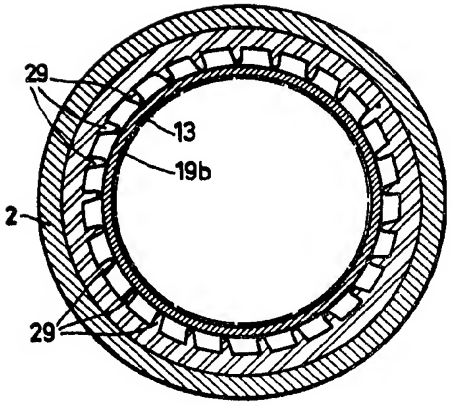


FIG.6

FIG.7